10.—Accessions of Sulphur in the Rainwater at Perth and Nedlands, Western Australia

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Analyses of rainwater for Perth and Nedlands in Western Australia were made from 1957 to 1959. Both stations are coastal and the sulphur accessions ranged between 1.2 and 6.0 lb/acre/year; these were not related to the amount of rainfall.

These amounts of sulphur are lower than those previously reported from Western Australia and from European and North American workers. The amounts of sulphur are regarded as insignificant for crop growth.

Introduction

Attention has been drawn to the low sulphur content of certain Australian soils. The relevant literature has been reviewed by Stephens and Donald (1958) who also discuss the limited amount of published work on the sulphur content of Australian rain. With such scant information it is impossible to ascertain the exact significance of rainfall in affecting the sulphur status of Australian soils.

Sulphur has been reported to be present in overseas rainfall in amounts which can favourably affect the sulphur content of the soil (Eriksson 1952).

Hutton and Leslie (1958) have shown for two Victorian coastal centres, that up to 7 lb sulphur/acre/year are received at Cape Bridgewater and 3 lb acre/year at Warrnambool. The amount of sulphur in the rain decreased to less than 2 lb acre/year at localities situated further inland. Hingston (1958), also at Perth, with a similar annual rainfall to the Victorian centres found that the amount of sulphur is between 8 and 10 lb acre/year. He concluded, as did the Victorian authors, that the sulphur content of rain was very low by European and North American standards. This paper is intended to augment the information on the sulphur content of Australian rain.

Material and Methods

Localities

Rainwater samples were collected, during 1957 and 1959 at the Institute of Agriculture, Nedlands, four miles west of Perth and at the Perth Observatory. Both localities are fairly removed from industrial contamination and are about four miles from the coast.

Collection Methods

Rainwater was collected in gallon polythene bottles fitted with a polythene funnel. The bottle and funnel were housed in a wooden box which had a series of wire spokes fitted to its outside edge at the top to prevent birds from alighting and contaminating the sample. The height of the collection unit from the ground to the top of the box was 4 ft 6 ins.

Samples of water were taken after periods of rain, filtered through a washed filter paper and stored in polythene bottles. A few drops of chloroform were added to prevent algal and other biological growth.

Analytical Methods

Sulphate-sulphur was estimated in the samples by the micro-method of Johnson and Nishita (1952). In this method sulphates were reduced to hydrogen sulphide by a mixture of hydriodic acid, formic acid and red phosphorus. The resulting hydrogen sulphide was estimated as methylene blue in an E.E.L. Absorptiometer using a red (608) filter and a 1 cm cuvette. 25 or 50 ml of rainwater were evaporated to dryness in the boiling flask of the special digestion distillation apparatus.

The 1959 samples were analysed by the barium chloride (ethylene-diamine-tetra-acetic acid) (E.D.T.A.) back titration method of Bond (1955). This procedure was adopted when reproductibility of the sulphur values could not be obtained owing to impurities in a batch of reagents. In the E.D.T.A. method, 200 ml of rainwater were analysed and the endpoint of the Eriochrome Black indicator was determined optically by means of an E.E.L. Titrator.

Results and Discussion

The sulphur data for 1957-1959 are given in Table 1. Considerable differences occur in the amounts of sulphur between the three years and these are not related to the amount of rain. The sulphur content of the rain is low.

TABLE I

Quantity of Sulphur in Rainwater 1957-1959

Locality	Rainfall Analysed (Inches)	Total Rainfall (Inches)	Sulphur (lb/acre)
Nedlands—			
1957	29·50	35·09	3·26
1958	30·51	32·07	1·21
1959	24·02	24·02	4·78
Perth—			
1957	32·11	33·40	3·81
1958	31·23	34·33	1·21
1959	24·23	24·23	5·97

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Perth and Nedlands may be considered as coastal as they are both about four miles from the ocean. The sulphur values are lower than the 8-10 lb/acre/year previously reported by Hingston (1958) and are more comparable to the values of Hutton and Leslie (1958) in Victoria.

At both localities in 1959 the sulphur values are considerably higher than those of the two previous years, despite a much lower rainfall. No explanation can be given, and the fact that the analytical method used was different is not considered to be a contributing factor. It has been mentioned above that the titration method was adopted in 1959 because of the difficulty of obtaining a satisfactory colorimetric determination due to impurities in a batch of reagents. When this factor was rectified a trial was done to estimate the errors involved. The standard error between the titration and colorimetric method was 0.084 p.p.m. sulphur. The local data of Hingston covered two year's observations and there was a difference of 2 lb/acre/year. The data of Hutton and Leslie apparently are only for a single year. A greater amount of atmospheric dust in the dry year of 1959 may account for the higher sulphur figures.

Eriksson (1958) quotes a figure of 10 Kg/hectare (approx. 9 lb/acre) as being the characteristic sulphur value for unpolluted air. The results given here do not support this contention in contrast to the previous findings of Hingston in Western Australia. The data are more comparable to those of Hutton and Leslie for two Victorian coastal stations.

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